DPR Guidelines for Hazardous Materials Response to Pesticide Exposures

Cal/EPA

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Worker Health and Safety Branch
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This information augments

Multi-Casualty Mass Decontamination Guidance Document for Field Responders

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Departmental Rational

- Material Safety Data Sheets (MSDS) are a source of chemical information, as is the pesticide label.
- However, the MSDS frequently references the undiluted material, not the finished mixture (usually containing water as its major component).
- The MSDS suggested response may be inappropriate.

Components of Exposure

Routes

Direct Exposure

(splash, spray, spill)

Indirect Exposure

(residue, drift, off-gassing)

Event Classifications

- Off Target Movement
  - **Drift**
  - **Odor/Off Gassing**
- Spills
  - **Concentrate**
  - **Dilute**
- Residue Contact
- Catastrophic Event

Off Target Movement

DRIFT & OFF GASSING

In general, drift is a particulate phenomenon, off-gassing a vapor phenomenon.

Off Target Movement
DRIFT

***Off target movement immediately after application*.**

- If aerosol, probably diluted with water

- If dust, probably undiluted

Off Target Movement
DRIFT

Aerosols

Insecticides

Herbicides

Dusts

Fungicides

Off Target Movement DRIFT:Aerosols

Insecticides of the AChE Class

(organophosphate/carbamate)

Serious threat is acute toxicity in the undiluted pre-application state.

However, most applications are of dilute solutions.

Off Target Movement DRIFT:Aerosols

Low Density Drift:

Insecticides/AChE Inhibitors

(outer clothing/skin not damp from DRIFT, no symptoms manifest)

1. Wash exposed areas
2. May remove outer clothing
3. Transport

Title 3 CCR Section 6726 (c).

Off Target Movement DRIFT:Aerosols

Medium Density Drift:

Insecticides/AChE Inhibitors

(outer clothing/skin damp from DRIFT, possible symptoms manifest)

1. Wash exposed areas
2. Should remove outer clothing
3. Transport

Off Target Movement DRIFT:Aerosols

High Density Drift:

Insecticides/AChE Inhibitors

(outer and inner clothing/skin damp or wet from DRIFT, possible symptoms manifest)

1. Remove all contaminated clothing
2. Decon as HAZMAT
3. Transport

Off Target Movement DRIFT:Aerosols

Herbicides

In general, herbicides do not have AChE activity, though they have alternative modes of toxicity:

Eye Irritation ***Dermal Irritation***

Respiratory Irritation ***Sensitizer***

Off Target Movement DRIFT:Aerosols

Low Density Drift:

Herbicides

(outer clothing/skin not damp from DRIFT, no symptoms manifest)

1. Wash exposed areas
2. May remove outer clothing
3. Transport

Off Target Movement DRIFT:Aerosols

Medium/High Density Drift:

Herbicides

(outer and inner clothing/skin damp or wet from DRIFT, possible symptoms manifest)

1. Remove all contaminated clothing
2. Decon as HAZMAT
3. Transport

Off Target Movement DRIFT:Aerosols

Other Materials

PGR/IGR, Liquid Fungicides

These are PESTICIDES

And

Fertilizers, soil amendments, plant nutrients

These are *not* PESTICIDES

Off Target Movement DRIFT:Aerosols

Low/Medium Density Drift:

Other Materials

(outer clothing/skin not damp from DRIFT, no symptoms manifest)

1. Wash exposed areas
2. May remove outer clothing
3. Possible transport

Off Target Movement DRIFT:Aerosols

High Density Drift:

Other Materials

(outer and inner clothing/skin damp or wet from DRIFT, possible symptoms manifest)

1. Remove all contaminated clothing
2. Decon as HAZMAT
3. Transport

Off Target Movement DRIFT:Dusts

Fungicides

(Primarily Sulfur, but can include others)

All fungicide dusts can cause dermal and eye irritation. Some can cause respiratory tract irritation.

Most dust applications are undiluted (i.e. right out of the bag)

Off Target Movement DRIFT:Dusts

Low Density Drift:

Fungicidal Dusts

(outer clothing/skin shows some signs of dust from DRIFT, no symptoms manifest)

1. Wash exposed areas
2. May remove outer clothing
3. Transport

Off Target Movement DRIFT:Dusts

Medium/High Density Drift:

Fungicidal Dusts

(outer clothing/skin covered in dust or dust under clothing from DRIFT, possible symptoms manifest)

1. Remove all contaminated clothing
2. Decon as HAZMAT
3. Transport

Off Target Movement
DRIFT: Aerosols & Dusts

In All Cases:

1. Remove from contaminated area
2. Label, bag & tag possessions
3. Provide with clean clothing as needed

Off Target Movement DRIFT:Aerosols & Dusts

All cases presenting eye irritation:

1. Irrigate eyes with clean water (side-stream irrigation)
2. Transport

Off Target Movement
Off Gassing/Odor

Some pesticide formulations are odoriferous and can exist in the gas phase, either by ***vaporization*** (insecticides, herbicides, fungicides) or in their ***initial state*** (fumigants).

Off Target Movement
Off Gassing/Odor

Fumigants

Fumigants can either be gasses at NTP (*methyl bromide, sulfuryl fluoride*) or can evolve from solids (*aluminum phosphide*) or liquids (*metam-sodium*).

Furthermore, the fumigant may undergo degradation to other hazardous materials (*metam-sodium to MITC/H_2S or ENZONE to CS_2*)

Site Evaluation

Hazard assessment

Measuring options include:

Colorimetric tubes:

Methyl Bromide

Phosphine

Methyl Iodide

Chloropicrin

Site Evaluation

Hazard assessment

Measuring options include:

Gas Detectors:

Sulfuryl fluoride

Phosphine

Site Evaluation

Hazard assessment

Gas Detectors:

Methyl bromide

Can only measure in ounces per 1,000 ft³. Not very useful for human safety information.

Off Target Movement
Off Gassing/Odor

Fumigants

Fumigants may be odorless:
Methyl bromide and sulfuryl fluoride

Or they may have highly irritating odors:
Chloropicrin* and TELONE II

*Used as warning agent for odorless fumigants

Off Target Movement
Off Gassing/Odor

Fumigants

Fumigants may become airborne and move off-site by degassing from untarped field, loss of tarp integrity, lack of water seal, chamber aeration, stack aeration, minor tank leak, normal detarping or unusual climatic conditions (inversions).

Off Target Movement
Off Gassing/Odor

Fumigants

The following responses are for agricultural off-gassing situations. If the source is a tank rupture or other large concentrated source, this should be classified as a

Catastrophic Event

Off Target Movement
Off Gassing/Odor

Fumigant ***Nearby***

Source within 300 meters

1. Evacuation advised, especially downwind.
2. Disappearance of trigger odor ***may*** be good indicator
3. Open buildings to disperse introduced gas
4. There is no decon for gas exposure.
5. Medical monitoring may be required.

Off Target Movement
Off Gassing/Odor

Fumigant ***Moderately Close***

Source between 300 & 1,000 meters

1. Seal *in situ*, especially downwind.
2. Evacuation probably not necessary.
3. Disappearance of trigger odor ***<u>may</u>*** be good indicator
4. Open buildings to disperse introduced gas.
5. There is no decon for gas exposure.
6. Medical monitoring may be required.

Off Target Movement
Off Gassing/Odor

Fumigant ***Distant***

Source over 1,000 meters

1. Evacuation probably not necessary.
2. Disappearance of trigger odor ***may*** be good indicator
3. Open buildings to disperse introduced gas.
4. There is no decon for gas exposure.
5. Medical monitoring may be required.

Off Target Movement
Off Gassing/Odor

Vaporizing Source

Odoriferous Materials

Some pesticides have high vapor pressures and can vaporize from the application site and become airborne. Many pesticides use hydrocarbon-based solvents or other high vapor pressure materials in their formulations. These too can wander off. They become a big problem if they stink.

R.O.T. for VP: Consider it a potential problem if it has **>**10^{-4} torr (760 torr = 1 atm) for vapor pressure

Off Target Movement
Off Gassing/Odor

Vaporizing Source

Odoriferous Materials

The odor of AChE inhibiting pesticides have not been reported to cause clinically depressed AChE. However, foul smelling odors can cause symptoms of illness to exposed persons (i.e. skunk smell, vomit smell). Additionally, the odor may not be the actual active ingredient, nor an intentional formulation product, but may be an unrefined byproduct.

Off Target Movement
Off Gassing/Odor

Vaporizing Source ***Nearby***

Odoriferous Source up to 300 meters

1. Evacuation not normally advised
2. Disappearance of trigger odor ***<u>may</u>*** be good indicator
3. Keep doors/windows closed during exposure.
4. Open doors/windows after exposure to aerate.
5. Medical monitoring may be required.

Off Target Movement
Off Gassing/Odor

Vaporizing Source ***Distant***

Odoriferous Source beyond 300 meters

1. Evacuation probably unnecessary
2. Disappearance of trigger odor ***may*** be good indicator
3. Keep doors/windows closed during exposure.
4. Open doors/windows after exposure to aerate.

Off Target Movement
SB 391 (Florez)

Under SB391, responsible parties in a drift or off-gassing incident are responsible for uncompensated medical costs to non-occupationally exposed persons (i.e. bystanders).

Only applies to incidents involving the application of pesticides in production of an agricultural commodity.

Does not apply to employees, who are covered under the worker's compensation system.

Also requires training such as this (Title 19 CCR Section 2725)

Spills

Concentrate versus Dilute

Material in an ag-use container is probably concentrated, up to 100% active ingredient. This is the most hazardous condition of a pesticide.

Directions for handling a spill are sometimes found on the label and on the MSDS. Since this is concentrate, the directions on the MSDS are appropriate.

Spills within structures (stores, storage closets, outbuildings, etc.) may also require active ventilation to disperse vapors/odors.

Spills

Concentrate versus Dilute

Dilute solutions (finished product, application ready) may be less than 1% active ingredient. This will be the material found in mix/load rigs, nurse tanks and the application equipment.

Many home use materials, especially the spray ready containers, are very dilute (10X to 200X). These dilutions will affect properties stated on the MSDS (flammability, corrosiveness, etc.).

Spills

Concentrate*

Unprotected Contact

1. Remove all contaminated clothing immediately.
2. Fully decontaminate with water or appropriate wash.
3. Transport to medical facility.

*This also applies to heavy exposure (drench/soak) to dilute material.

Spills

Dilute

Unprotected Contact

1. Remove contaminated clothing immediately.
2. Wash/rinse contaminated skin with water.
3. Transport to medical facility.

Spills

In Field

If the spill is confined to the application site, the best response may be to leave it in place.

Further dilution with water may be advised, taking care to prevent off-site water-source contamination (including well heads, water bodies, streams etc.).

If the spill is outside the application site, or wreckage must be removed, normal HAZMAT procedures should be followed.

Residue Contact

Pesticides may leave residue after gross decontamination (water wash, sweeping, wiping etc.).

Most pesticides will degrade over time via such routes as photolysis, hydrolysis, thermal degradation, oxidation, and bacterial decomposition.

Restricted Entry Intervals (REI) are set for many pesticides. This is the amount of time that must pass before unprotected workers are allowed into a

Residue Contact

REI lists are available form local CAC, from DPR or may be on the pesticide label.

Pesticides with REIs require postings that list the pesticide, REI expiration, and applicator.

In general, ***minimum*** REIs are:

Category I = 48 hours

Category II =24 hours

Category III = 12 hours

Residue Contact
Decontamination

Surface Residue Contact

1. Wash exposed skin surfaces
2. Change into uncontaminated clothing as necessary
3. Transport to medical facility

Residue Contact
Emergency Responders

Your standard turnout or bunker gear should provide adequate protection from surface residues found in agricultural conditions.

Avoid unprotected contact with foliar or other suspected contaminated surfaces.

Harvesters have been in direct, prolonged, unprotected contact, resulting in illness.

Most likely contaminated area: Lower legs (probably unavoidable).

Catastrophic Event

In this case, we're not talking agricultural use of a hazardous chemical, we're talking major disaster (fumigant tank rupture, chlorine tank leak).

Spilled rail cars and tankers of pesticides are also catastrophic events, but unless the material is volatile, poisonous air masses may not be present downwind. Treat as any other toxic chemical spill.

However, for fumigants…

Catastrophic Event

Fumigant Leak

In the case of massive fumigant leaks, generating highly concentrated parcels of poisonous gas, minimal response is:

1. Evacuation of all people and pets potentially downwind for up to 2,000 meters.
2. After gas has dissipated, decon is once again, aeration (open windows, doors of affected structures). Active mechanical ventilation may be advised, especially in “dead zones”.

Catastrophic Event

Off-gassing Suicide

In 2003, a woman ingested several aluminum phosphide tablets. Aluminum phosphide reacts with water to form phosphine gas.

On arrival at the hospital, a garlic odor was noted and staff began to experience symptoms.

HAZMAT was summoned and ended up triple bagging the body.

A total of six hospital personnel were reported to have been affected by the exposure.

Additional Information

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